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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/780,774	02/19/2004	Takashi Shirakawa	023971-0374	2066
22428 7590 03/06/2007 FOLEY AND LARDNER LLP SUITE 500 3000 K STREET NW WASHINGTON, DC 20007			EXAMINER NGUYEN, TU MINH	
			ART UNIT 3748	PAPER NUMBER
SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE		
3 MONTHS	03/06/2007	PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

## Office Action Summary

Application No.

10/780,774

Applicant(s)

SHIRAKAWA ET AL.

Examiner

Tu M. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 February 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-7,12,16 and 19-22 is/are rejected.
- 7) ☒ Claim(s) 8-11,13-15,17 and 18 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### DETAILED ACTION

1. An Applicant's Request for Continued Examination (RCE) and an Applicant's Amendment filed on February 22, 2007 have been entered. Claim 2 has been canceled; claims 1, 19, and 20 have been amended; and claims 21-22 have been added. Overall, claims 1 and 3-22 are pending in this application.

#### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office Action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 3, 4, 7, 12, and 19-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Sawada et al. (U.S. Patent 6,263,667).

Re claims 1 and 19-22, as shown in Figures 1, 2, 3, 7, 11, and 12, Sawada et al. disclose an exhaust gas purifying apparatus and an exhaust gas purifying method for an internal combustion engine (1), the apparatus comprising:

- an NOx removing catalyst (7) that absorbs nitrogen oxides in an exhaust gas of the engine when an air-fuel ratio of the exhaust gas streaming thereinto is lean and that releases and reduces the absorbed nitrogen oxides therefrom when the air-fuel ratio of the exhaust gas streaming thereinto is rich (lines 56-67 of column 9);

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- an exhaust gas atmosphere varying section (30) that varies a ratio (air-fuel ratio) between an oxidizing agent in the exhaust gas and a reducing agent therein;
- a first exhaust gas atmosphere detecting section (31) disposed in an upstream side of an exhaust passage with respect to the NOx removing catalyst to detect the ratio between the oxidizing agent in the exhaust gas and the reducing agent therein;
- a second exhaust gas atmosphere detecting section (33) disposed in a downstream side of the exhaust passage with respect to the NOx removing catalyst to detect the ratio between the oxidizing agent in the exhaust gas and the reducing agent therein; and
- an abnormality determining section (30, Figures 7 and 12) that executes an abnormality determination of the NOx removing catalyst on the basis of output values of both of the first exhaust gas atmosphere detecting section and the second exhaust gas atmosphere detecting section from a time at which the output value (AFU) of the first exhaust gas atmosphere detecting section is varied to a first predetermined value (RICH, see Figure 2(A)) to a time at which the output value (AFD) of the second exhaust gas atmosphere detecting section reaches a second predetermined value (RICH, see Figure 2(B)) when the exhaust gas atmosphere varying section increases the ratio between the reducing agent and the oxidizing agent in the exhaust gas,

wherein the abnormality determining section (see Figures 11-12) calculates (in step 1123) an integration quantity (CATDOL) with respect to time on the basis of a previous integration quantity with respect to time and a difference (DAFS) between the output value (AFU) of the first exhaust gas atmosphere detecting section and the output value (AFD) the second exhaust gas atmosphere detecting section and executes (in step 1211) the abnormality determination of

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the NOx removing catalyst on the basis of the calculated integration quantity (CATDOL) of the difference (DAFS) when the exhaust gas atmosphere varying section increases the ratio between the oxidizing agent and the reducing agent in the exhaust gas.

Re claim 3, in the apparatus of Sawada et al., each of the first exhaust gas atmosphere detecting section (31) and the second exhaust gas atmosphere detecting section (33) detects an oxygen concentration in the exhaust gas.

Re claim 4, in the apparatus of Sawada et al., each of the first exhaust gas atmosphere detecting section (31) and the second exhaust gas atmosphere detecting section (33) detects an air-fuel ratio of the exhaust gas.

Re claim 7, in the apparatus of Sawada et al., the first exhaust gas atmosphere detecting section comprises an upstream side oxygen concentration sensor (31) disposed at the upstream side of the exhaust passage with respect to the NOx removing catalyst and the second exhaust gas atmosphere detecting section comprises a downstream side oxygen concentration sensor (33) disposed at the downstream side of the exhaust passage with respect thereto and wherein the abnormality determining section executes the abnormality determination of the NOx removing catalyst for an interval of time (TSTR) at which the output value of the downstream side oxygen concentration sensor is maintained within a predetermined range in the vicinity to a stoichiometric air-fuel ratio when the exhaust gas atmosphere varying section increases the ratio of the reducing agent in the exhaust gas, as clearly shown in Figures 2(A) and 2(B).

Re claim 12, in the apparatus of Sawada et al., the first and second exhaust gas atmosphere detecting sections comprise an upstream side lambda sensor (31) and a downstream side lambda sensor (33), respectively, and wherein the apparatus further comprises an excess air

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ratio calculating section that calculates an upstream side excess air ratio (upstream air-fuel ratio) at the upstream side of the NOx removing catalyst on the basis of a pump current value of the upstream side lambda sensor and calculates a downstream side excess air ratio (downstream air-fuel ratio) at the downstream side of the NOx removing catalyst on the basis of the pump current value of the downstream side lambda sensor.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sawada et al. as applied to claim 4 above, in view of Bidner et al. (U.S. Patent 6,763,656).

The apparatus of Sawada et al. discloses the invention as cited above, however, fails to disclose that instead of an oxidant storage amount in the NOx catalyst, the abnormality determining section calculates an extra HC quantity in the exhaust gas on the basis of the detected exhaust gas air-fuel ratio and an intake fresh air quantity.

As shown in Figure 1, Bidner et al. disclose an air-fuel ratio control for an internal combustion engine having a NOx trap (36), an upstream oxygen sensor (38), and a NOx sensor (40). As depicted in Figures 8 and 9 and indicated in claims 1 and 3, Bidner et al. teach that it is conventional in the art to compute an extra HC amount in the exhaust gas on the basis of the

detected exhaust gas air-fuel ratio and an intake fresh air quantity. And a NOx purge of the NOx trap is terminated a difference between the extra HC amount in the exhaust gas at the upstream side of the NOx trap and the extra HC amount in the exhaust gas at the downstream side of the NOx trap exceeds a threshold value. It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the teaching by Bidner et al. in the apparatus of Sawada et al., since the use thereof would have been routinely practiced by those with ordinary skill in the art.

6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sawada et al. as applied to claim 1 above, in view of Surnilla et al. (U.S. Patent 6,477,832).

The apparatus of Sawada et al. discloses the invention as cited above, however, fails to disclose that the abnormality determining section suspends the abnormality determination of the NOx removing catalyst when at least one of the first exhaust gas atmosphere detecting section (31) and the second exhaust gas atmosphere detecting section (33) is deemed to be deteriorated such that the difference of the output values of the first exhaust gas atmosphere detecting section and the second exhaust gas atmosphere detecting section is larger than a third predetermined value when the output value of the second exhaust gas atmosphere detecting section reaches the second predetermined value.

As shown in Figure 1, Surnilla et al. disclose an air-fuel ratio control for an internal combustion engine having a NOx trap (72), an upstream oxygen sensor (76), and a NOx sensor (140). As depicted in Figure 13, Surnilla et al. teach that it is conventional in the art to suspend an air-fuel ratio control when a difference of output values of the oxygen sensor and the NOx sensor exceeds a predetermined value (step 1414 with Yes answer) when the output value of the

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NOx sensor indicates that a NOx purge is on going (step 1410 with Yes answer). It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the teaching by Surnilla et al. in the apparatus of Sawada et al., since the use thereof would have been routinely practiced by those with ordinary skill in the art.

7. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sawada et al. in view of Bidner et al. as applied to claim 5 above, and further in view of Adamczyk, Jr. et al. (U.S. Patent 5,524,433).

The modified apparatus of Sawada et al. discloses the invention as cited above, however, fails to disclose the procedure to calculate an extra HC quantity in the exhaust gas on the basis of the detected exhaust gas air-fuel ratio and an intake fresh air quantity.

As shown in Figure 3, Adamczyk, Jr. et al. disclose an apparatus to monitor the performance of a hydrocarbon engine emission trapping device (31) having an upstream lambda sensor (56) and a downstream lambda sensor (57). As indicated on line 29 of column 5 to line 4 of column 6, Adamczyk, Jr. et al. teach that it is conventional in the art to compute an excess HC amount stored or desorbed from the trapping device is by calculating HC amounts at an upstream location and a downstream location of the device; wherein the HC amount is based on an excess air ratio determined from a lambda sensor and an intake air quantity. It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the teaching by Adamczyk, Jr. et al. in the modified apparatus of Sawada et al., since the use thereof would have been routinely practiced by those with ordinary skill in the art.



***Allowable Subject Matter***

8. Claims 8-11, 13-15, 17, and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Response to Arguments***

9. Applicant's arguments with respect to the references applied in the previous Office Action have been fully considered but they are moot in view of the new ground(s) of rejection.

***Prior Art***

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure and consists of three patents: Theis (U.S. Patent 6,497,092), Takaku et al. (U.S. Patent 6,502,388), and Miyoshi et al. (U.S. Patent 6,834,497) further disclose a state of the art; wherein Theis discloses in Figure 5 that a NO<sub>x</sub> release time which is similar to a rich time (TSTR) in Sawada et al., is utilized to obtain a NO<sub>x</sub> release or adsorbed amount in a NO<sub>x</sub> adsorber.

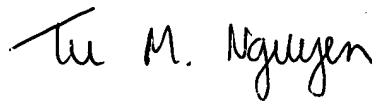
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*Communication*

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Tu Nguyen whose telephone number is (571) 272-4862.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Thomas E. Denion, can be reached on (571) 272-4859. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



TMN

Tu M. Nguyen

March 5, 2007

Primary Examiner

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